

Astronomy

ES-2 The student will demonstrate an understanding of the structure and properties of the universe.

ES-2.3 Summarize the evidence that supports the big bang theory and the expansion of the universe (including the red shift of light from distant galaxies and the cosmic background radiation).

Taxonomy level: 2.4-B Understand Conceptual Knowledge

Previous/future knowledge: The big bang theory and the expansion of the universe is a new concept for this course; it has not been presented in any previous grades.

It is essential for students to know that the *big bang theory* states that the universe began as a concentrated point of matter and energy that was propelled outward and has been expanding ever since. As gravity began to have an effect, galaxies formed. The galaxies continued to move outward. There is another theory, the steady-state theory, but evidence weighs in favor of the big bang. Evidence that students need to investigate includes the red shifts of galaxies and cosmic background radiation.

It is not essential for students to compare the big bang theory to other theories. An understanding of critical density and the ultimate fate of the universe based on this theory are not necessary at this time.

Assessment Guidelines:

The objective of this indicator is to *summarize* evidence that supports the big bang theory and that the universe is expanding; therefore, the primary focus of assessment should be to generalize major points concerning this evidence.

In addition to *summarize* appropriate assessments may require students to:

- *infer* from scientific evidence the idea that the universe is expanding; or
- *explain* how each piece of evidence is important to the overall theory.